Reviewer 2

This paper details a methodology for use of SAR sea-ice drift vectors for validation of PMW sea-ice drift, allowing for full coverage validation of the Antarctic where in-situ data is only available in limited areas, and rigorously analyses the robustness of this methodology. In addition there is an excellent analysis of the sources of error in the NSIDC Polar Pathfinder sea-ice drift product, with recommendations for future improvement. The techniques and analysis in this paper will be a great reference to inform future development for not only the NSIDC product but for other products as well. I recommend publication of this paper with minor changes.

- Thank you for your time and positive feedback.

Major comments:

- Section 2.4. Once spatially sampled, the PMW and SAR ice drift vectors are representing the average ice drift within sub-regions of radius 25 km, whereas the buoy vectors represent point-like sub-regions. This may be worth a sentence or two of discussion, since the SAR and buoy ground truths represent different spatial scales.
    - Thank you for pointing this out. We add the following sentences, along with some previous studies that mentioned this issue: *"We note that both SAR and PMW ice drift vectors represent the average ice drift within a large area of radius 25 km, whereas the buoy vectors represent point-like ice drift at deployed ice floes. This scale mismatch, alongside spatial and temporal collocation errors, introduces a representativeness error that may partly explain the observed discrepancies between satellite-derived and buoy-measured ice drift (Sumata et al., 2014; Lavergne et al., 2010). Since this representativeness error is difficult to fully separate from intrinsic retrieval errors, the validation statistics reported in this study likely contain contributions from both error sources."*
    - Sumata, H., Lavergne, T., Girard-Ardhuin, F., Kimura, N., Tschudi, M. A., Kauker, F., Karcher, M., and Gerdes, R.: An intercomparison of Arctic ice drift products to deduce uncertainty estimates, Journal of Geophysical Research: Oceans, 119, 4887–4921, 2014.
    - Lavergne, T., Eastwood, S., Teffah, Z., Schyberg, H., and Breivik, L.-A.: Sea ice motion from low-resolution satellite sensors: An alternative method and its validation in the Arctic, Journal of Geophysical Research: Oceans, 115, 1–14, 2010.
- Given that most of the larger deviations of the PMW vectors from buoy vectors come from areas of low SIC, and that SAR vectors have only been compared to the buoy vectors in regions of SIC > 85% while the PMW vectors have been taken from regions of SIC > 15%, I would really appreciate seeing statistics (extra figures might inflate the

paper too much) for PMW vectors where SIC > 85%, so there is a more direct comparison between the PMW-buoy and SAR-buoy validations.

- Thank you for your insightful and constructive comment. We agree that it is helpful to show additional statistics for SIC > 85 %. In sections 3.2 and 4.1, we add the statistics of PMW v. buoy comparisons for SIC > 85 % areas.
- *"For SIC > 85 %, the negative bias is ~1.97 km d^{-1}."*
- *"For where SIC > 85 %, PMW_{raw} exhibits only ~0.6 km d^{-1} of speed bias against buoy measurements."*

Minor comments:

- A table summarising the statistical values from the different validations could be very helpful to the reader, rather than needing to find the individual values from within the text to compare.
  - Thank you for your comments. We add a table summarizing the results (Table 1).
- L50-55, Just as a point of interest, SH PMW ice drift has also been validated vs buoys in the OSI SAF validation reports for the near-real time sea-ice drift product (https://osi-saf.eumetsat.int/products/osi-405-d, doi:10.15770/EUM_SAF_OSI_NRT_2007) and sea-ice drift climate data record (https://osi-saf.eumetsat.int/products/osi-455, doi:10.15770/EUM_SAF_OSI_0012).
  - Thank you for your information. We add some explanations about these technical reports: *"The PMW sea ice drift products from the Ocean and Sea Ice Satellite Application Facility (OSI SAF) have also been validated against buoy data in the Southern Ocean (Lavergne and Down, 2022, 2024)."*
- L137 Please define the FT abbreviation on first use."
  - FT stands for feature tracking. We replace FT with feature tracking.
- L142. Is it worth explaining/justifying why you omit SAR ice vectors above 40 km d^{-1} - is this dependent on your constraint that SAR data is only used for SIC > 85%?
  - We used 40 km/day because it is the upper limit of the search window for SAR sea ice tracking (Muckenhuber et al., 2016; Korosov et al., 2017). We add these references.
  - Muckenhuber, S., Korosov, A. A., and Sandven, S.: Open-source feature-tracking algorithm for sea ice drift retrieval from Sentinel-1 SAR imagery, The Cryosphere, 10, 913–925, 2016.
  - Korosov, A. A. and Rampal, P.: A Combination of Feature Tracking and Pattern Matching with Optimal Parametrization for Sea Ice Drift Retrieval from SAR Data, Remote Sensing, 9, 2017.
- Figure 1 could perhaps have larger individual panels, as some of the magenta arrows do not show up well at the current resolution.
  - We enlarged the individual panels in Figure 1 to clearly show the magenta arrows.

- Probably too complicated, but it would have been nice to plot figure 9a with the data from figure 5a as a background, to be able to compare easily.
    - Thank you for your suggestion. Plotting Figure 9a with Figure 5a as a background would make the comparison straightforward in a single figure, but we are concerned that this can reduce the legibility of the figure. Hence, we prefer to leave the current figure as is.
- Figure 11b label should probably specify PMW_raw rather than PMW.\
    - We specify PMW_{raw} in Figuree 11, and PMW in Figure 7.